Addressing Ecological Risks in the Kalamazoo River Floodplains

Introduction

- USEPA is developing a proposed remedy for the exposed former sediments of the Plainwell Impoundment.
- As a part of this process, USEPA plans to support the CDM 2002 ERA with few changes.
- The CDM 2002 ERA evaluates modeled or "theoretical" risks to the American robin.
- Estimated risk to robins is currently the primary driver for potential clean up of the exposed former sediments in the Plainwell Impoundment.

KRSG's Position

- KRSG advocates using the best available scientific information to assess ecological risk and make remedial decisions.
- A baseline assessment should include more sophisticated, site-specific biological lines of evidence when available.
- MSU has conducted important site-specific studies over the past 3 years to evaluate risk to ecological receptors.
- The results from these studies contradict the CDM 2002 ERA and demonstrate that birds are not at risk.
- The CDM 2002 ERA in its current form does not provide an appropriate technical basis for remedial decisions.

Presentation Overview

1. MSU studies evaluating site-specific risk to birds in floodplain
2. Technical concerns with theoretical estimates of risk to birds in CDM 2002 ERA
3. KRSG Recommendations
4. Summary and Conclusions

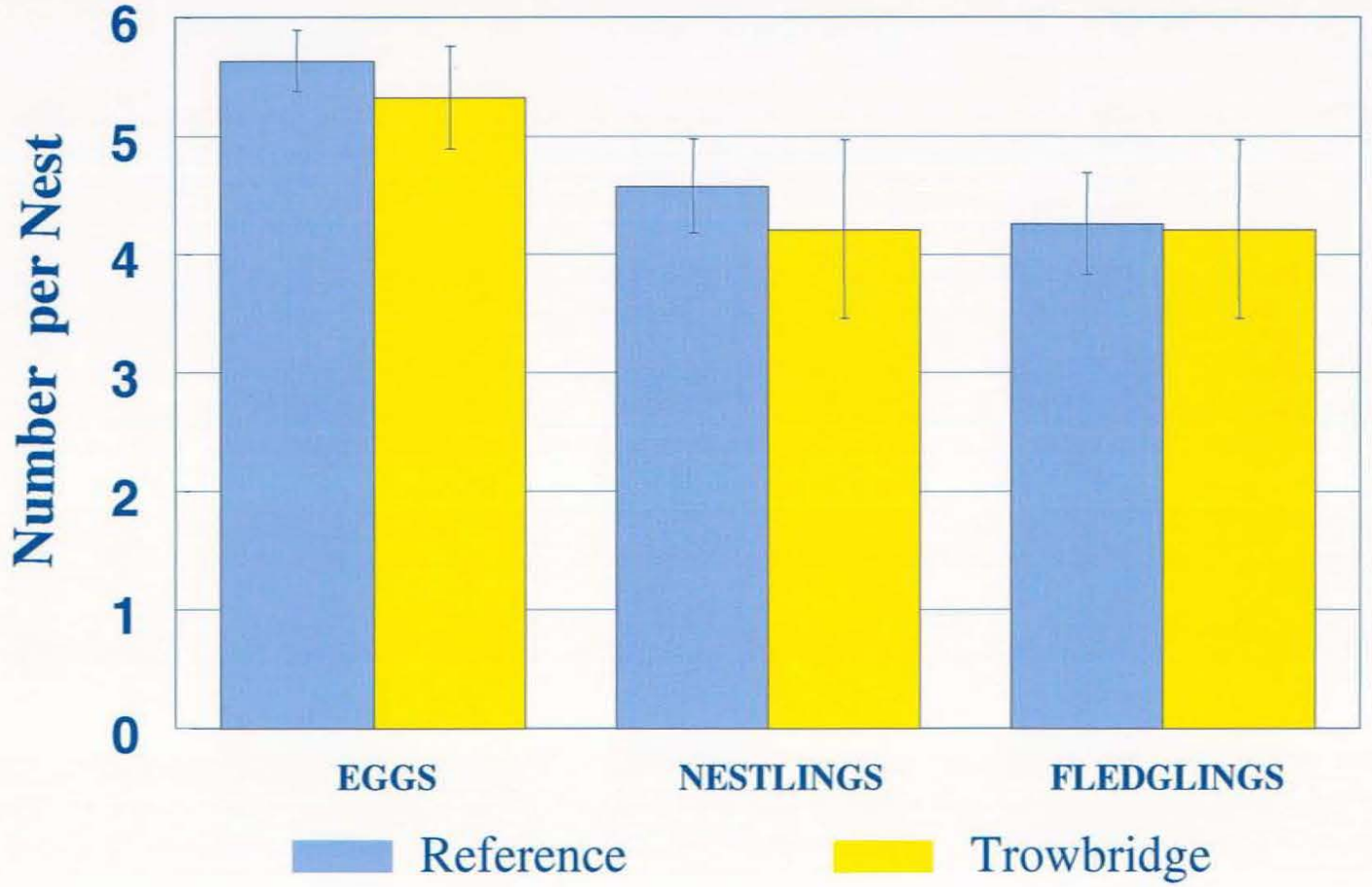
1. MSU Measures of House Wren Productivity and Exposure

- Measures of Productivity
  - Eggs/nest
  - Nestlings/nest
  - Fledglings/nest
- Measures of Exposure
  - Egg PCB Concentrations
  - Nestling PCB Tissue Concentrations

Egg and Nestling Production

Kalamazoo Impoundment vs Reference Area

House Wren



House Wrens - Relative Exposure to PCBs

- House wren egg concentrations in Trowbridge
  - 1.96 to 8.28 mg/kg (n=11)
- American robin egg concentrations in Plainwell
  - 0.105 to 3.77 mg/kg (n=2)

Housatonic River Robin Study

- Site and Reference robin productivity were not statistically different.
  - Number of eggs laid
  - Number of eggs hatched
  - Number of young fledged
- Robin egg PCB were more than an order of magnitude higher than robins from Plainwell (40 to 120 mg/kg).

Conclusions of Site-Specific House Wren Study

- Productivity of house wrens did not differ between Site and reference locations.
- Wren and Robin exposures were similar, indicating wrens an appropriate and representative insectivorous receptor.

2. Specific Technical Issues with CDM 2002 ERA

- Site-specific data do not support risk conclusions presented in 2002 ERA.
  - House wren
  - Short tail shrew
  - Great horned owl

Evolution of Risk Estimates to the American Robin

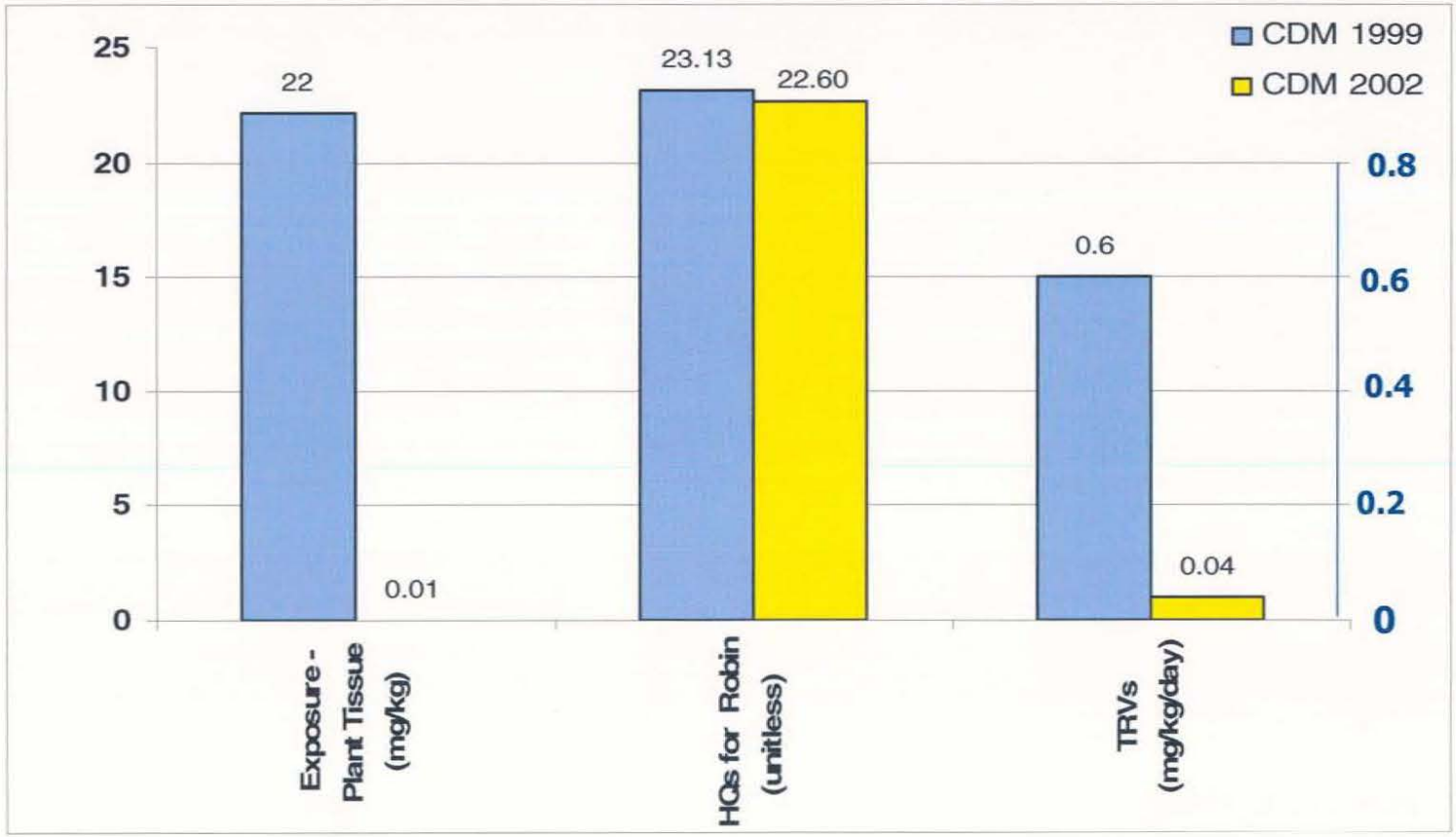
- The 1999 CDM draft ERA used modeled PCB plant tissue concentrations to estimate exposure.
  - The models overestimated plant uptake by several orders of magnitude.
- The 2002 CDM ERA draft was revised to incorporate site-specific plant data.
  - With other factors remaining the same, this would have resulted in HQs an order of magnitude lower and little or no risk to robins.

Evolution of Risk Estimates to the American Robin (cont.)

- HQs in the revised 2002 ERA remained effectively unchanged.
  - Avian TRV was lowered by more than an order of magnitude with no explanation.
  - Both TRVs were based on studies with domestic chickens with no explanation of why one would be preferable over the other.

Exposure and Effects Estimates

CDM 1999 vs CDM 2002



3. KRSG Recommendations

- Use site-specific exposure data (i.e., plant and worm tissue data)
- Use ecologically relevant TRV

KRSG Recommended TRV for the American Robin

- Proposed TRV provided in draft ERAs submitted to MDEQ (2000 and 2001) and in a memo to USEPA in October 2002.
- TRV based on pheasant study (Dahlgren et al, 1972).
- Dahlgren Study used by USEPA in:
  - The Great Lakes Water Quality Initiative documents (USEPA, 1995).
  - Final BERA of the Hudson River (USEPA, 2000).

Summary of TRVs for the Kalamazoo River

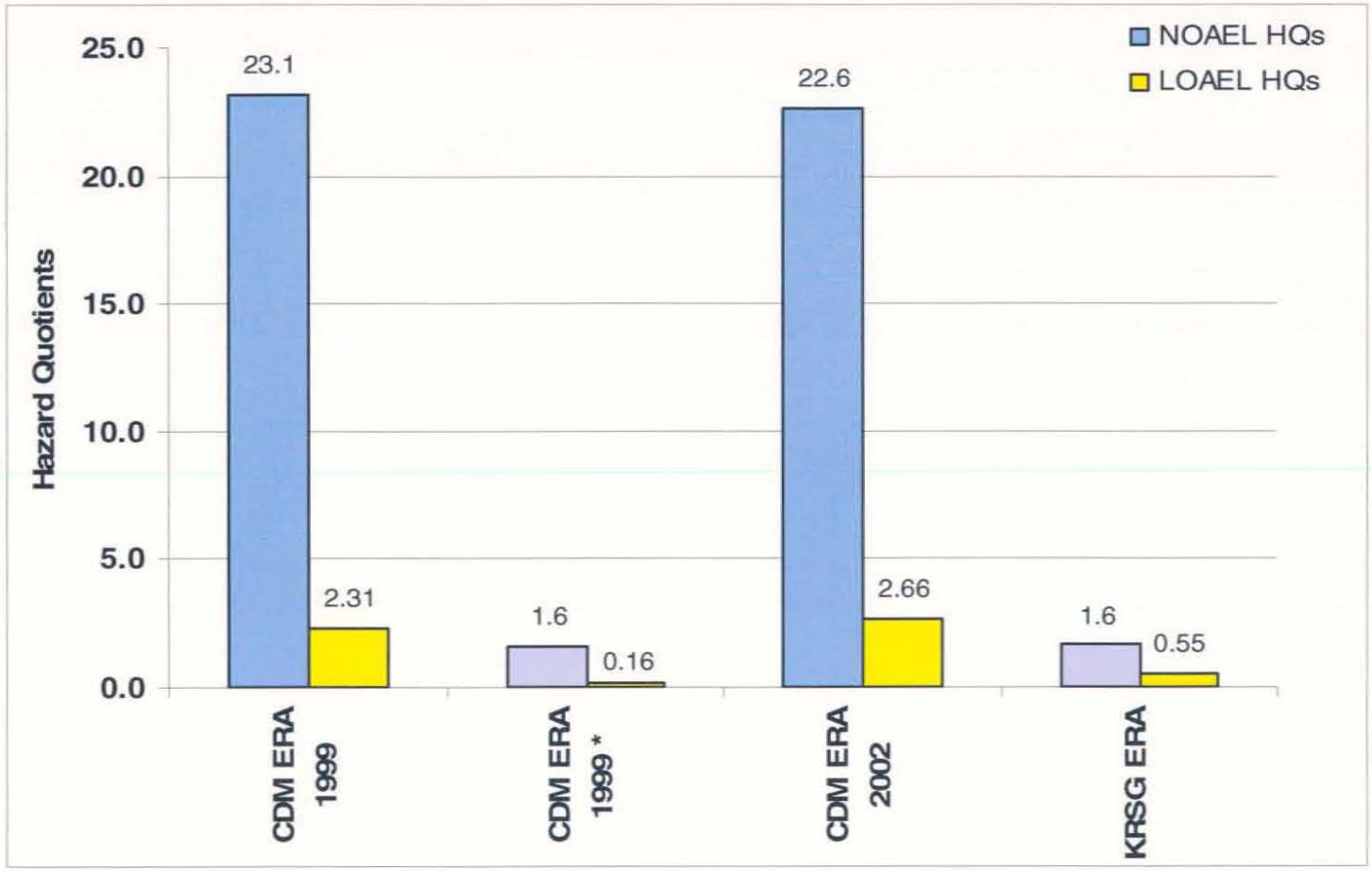
Avian TRVs	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)
1999 Draft CDM ERA	**0.6**	**6**
2002 CDM ERA	**0.04**	**0.34**
KRSG Proposed Avian TRVs	**0.6**	**1.8**

Summary of Avian TRVs for Other Sites

Avian TRVs (mg/kg/day)	Low TRV	High TRV
Hudson River	**1.8**	**7.1**
Fox River	**0.112**	**1.12**
Kalamazoo River (CDM)	**0.04**	**0.34**

Comparison of Hazard Quotients

CDM ERA Assumptions vs KRSG Assumptions



*HQ calculated using CDM 1999 assumptions with site-specific plant tissue concentrations

4. Summary and Conclusions

- All available data should be used in the ecological risk assessment.
- The CDM 2002 ERA is technically flawed and significantly overstates risk. The passerine TRV needs to be adjusted.
- Releasing the current document will likely result in public expectation of massive removal in the Plainwell impoundment.

Kalamazoo River Project

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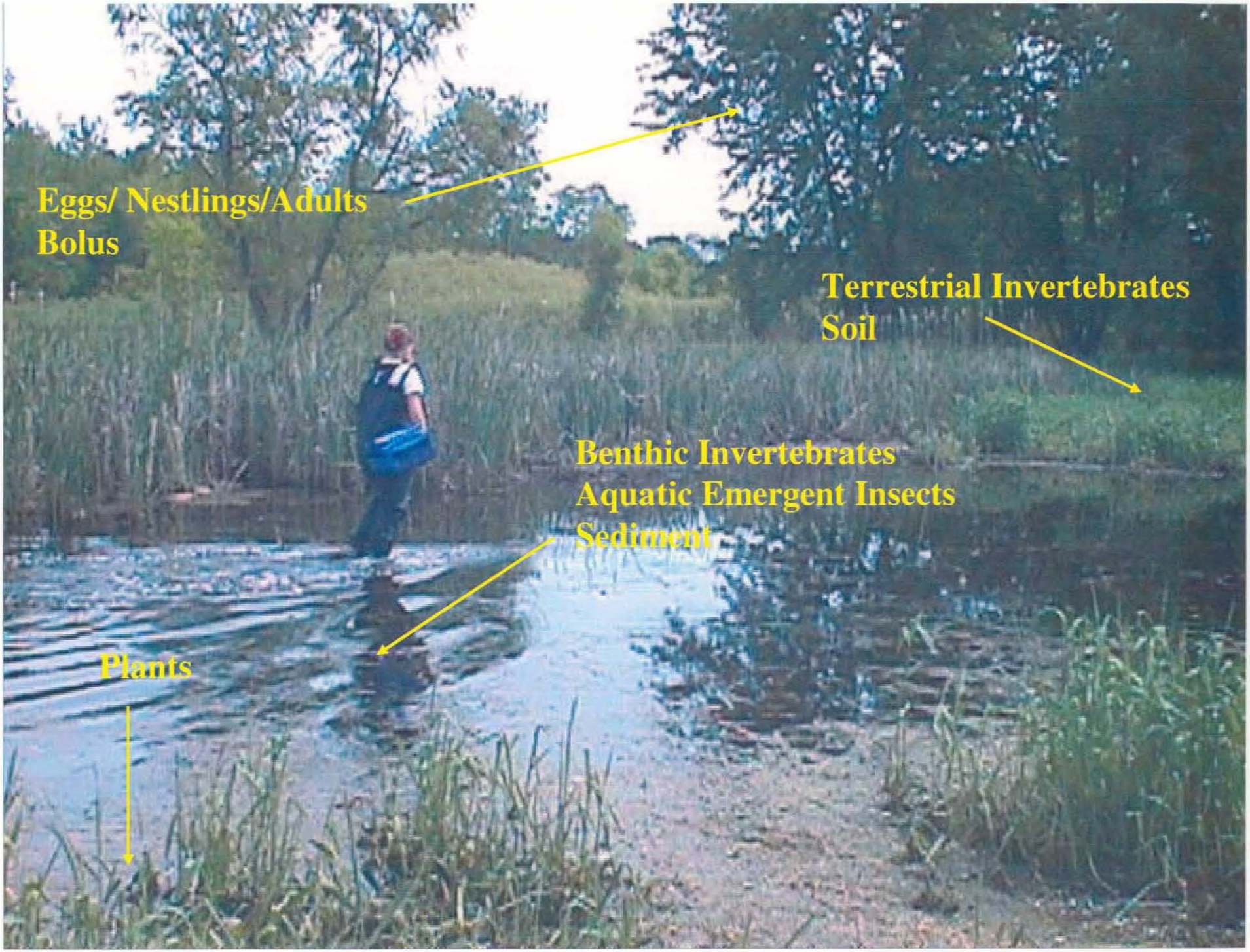
Eggs/ Nestlings/Adults
Bolus
Terrestrial Invertebrates
Soil
Benthic Invertebrates
Aquatic Emergent Insects
Sediment
Plants

- **Focus on two locations for food web analysis**
  - Former Trowbridge impoundment as a worst-case
    - Largest of the impoundments, greatest mass of PCBs, and has the PCB concentration in the surficial soils which are greater than or equal to the other impoundments
  - Fort Custer Recreation Area as a reference
    - Selected because it is upstream of KRAOC and relatively uncontaminated with PCBs

Terrestrial Receptors

- American Robin
- European Starling ⇒ House Wren/Blue Bird
- Short Tailed Shrew
- Great Horned Owl

Reviewers Comments

- **Habitat ill suited for American robin and European starling (John Lerg, MDNR Biologist, Ray Adams, KNC)**

Comments Realized

- **79 European Starling boxes deployed in 2000**
  - **0 % occupamcy**

Comments Realized

- **Site-wide survey for natural nests located**
  - **0 starling nests**
  - **0 robin nests**

- **Parallel surveys conducted by USFWS covering all impoundments between 2000-2002 found 0 American Robin nests.**

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Results From Related MSU Studies
Great Horned Owls

Nest Location	Blood Plasma PCBs (µg/Kg, ww)	Mean Blood PCBs (µg/Kg, ww)
Background Sites (n=3)	14.0 – 15.1	14.8 ± 5.1
Plainwell/Otsego (n=2)	37.4 – 65.8	51.6 ± 20.1
Trowbridge (n=7)	18.1 – 82.5	49.5 ± 22.4
Swan Creek/ Koopman's Marsh (n=4)	102 – 198	149 ± 61.3

Turdus migratorius

"An ecological risk assessment of a Superfund site concerns itself only with those species that are actually or potentially adversely affected by site contamination"

Turdus migratorius

- *Actually adversly affected ?*
  - *While quite common locally, American robins are not found on site*
    - *Present plant community structure not suitable for invertabrate foraging*
    - *Poor soil physical structure does not readily support earthworms*
    - *2 eggs collected had low PCB concentrations (0.4 and 3.77)*
    - *Results of the MSU-ATL house wren study*

Results From Related MSU Studies

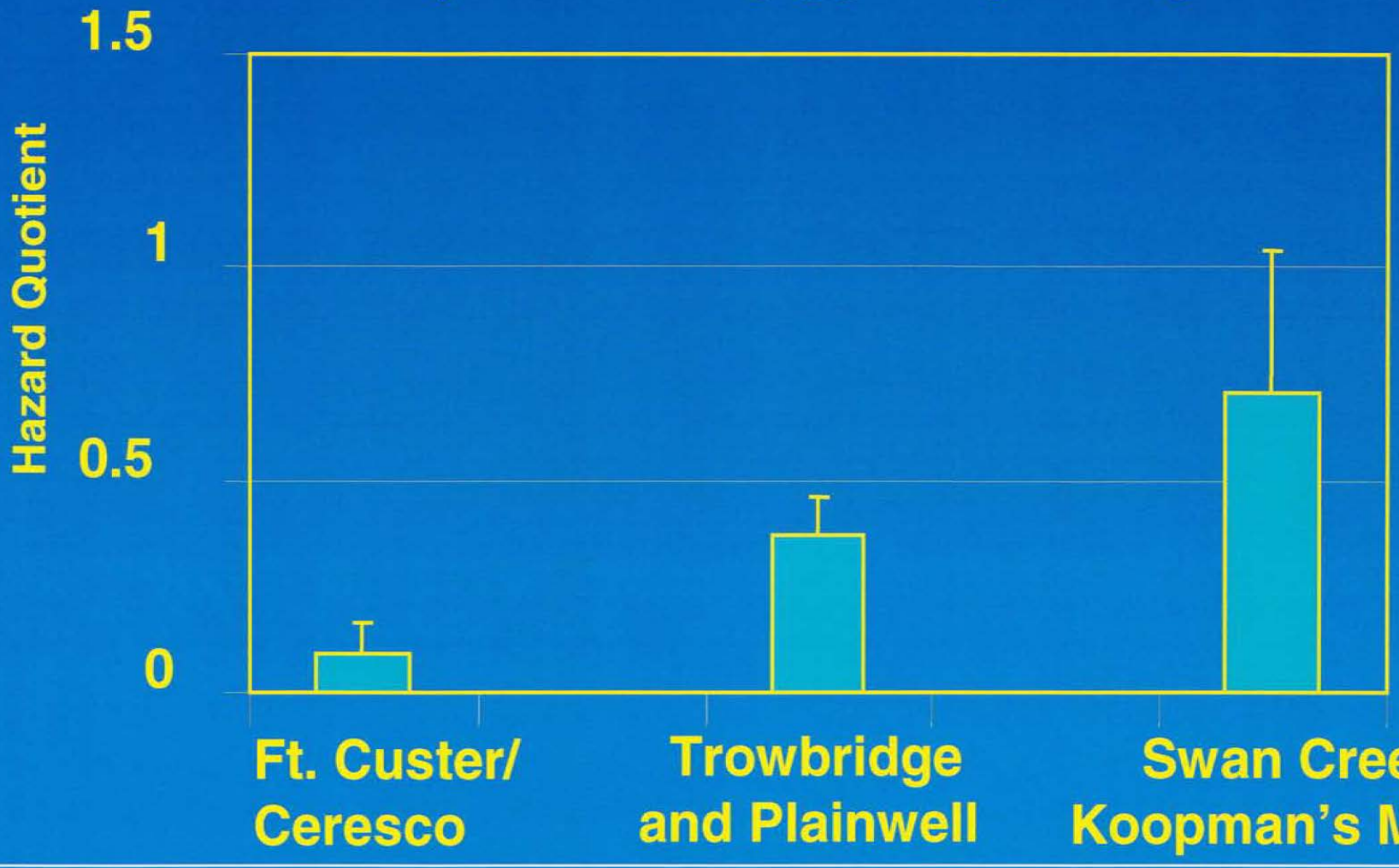
Tree Swallow/House Wren

- Adult, nestling and egg total PCB concentrations from TB are well below those expected to cause adverse effects.
- Passerine behavioral measurements were not different between TB and the upstream site.
- Based on the above, significant differences in passerine productivity measurements would be expected and none were seen

Results From Related MSU Studies Short Tailed Shrew

- Tissue-residue based HQs are less than 1.0 for all scenarios except the 95% UCL exposure level combined with the NOEL TRV which results in an HQ of 1.4
- Dietary-based hazard quotients are all less than 1
- Trapping results indicated that viable populations of shrews and other small mammals are present at the former Trowbridge impoundment

Results From Related MSU Studies
Great Horned Owls
Site Specific HQs (egg and plasma)



Conclusions

- **All lines of evidence examined thus far suggests PCB contaminated impoundment soils do not pose a significant risk to terrestrial receptors**